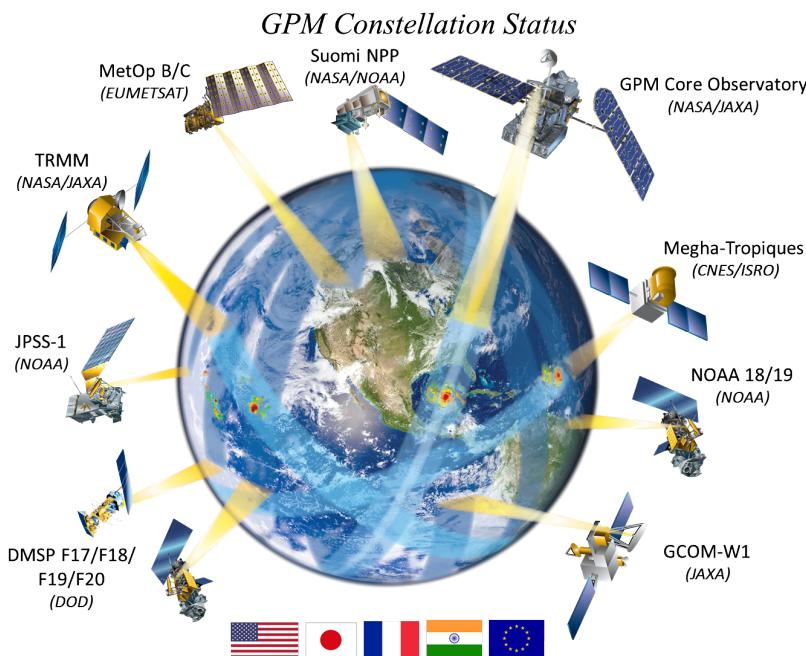


The GPM Microwave Imager & Constellation Algorithm Status

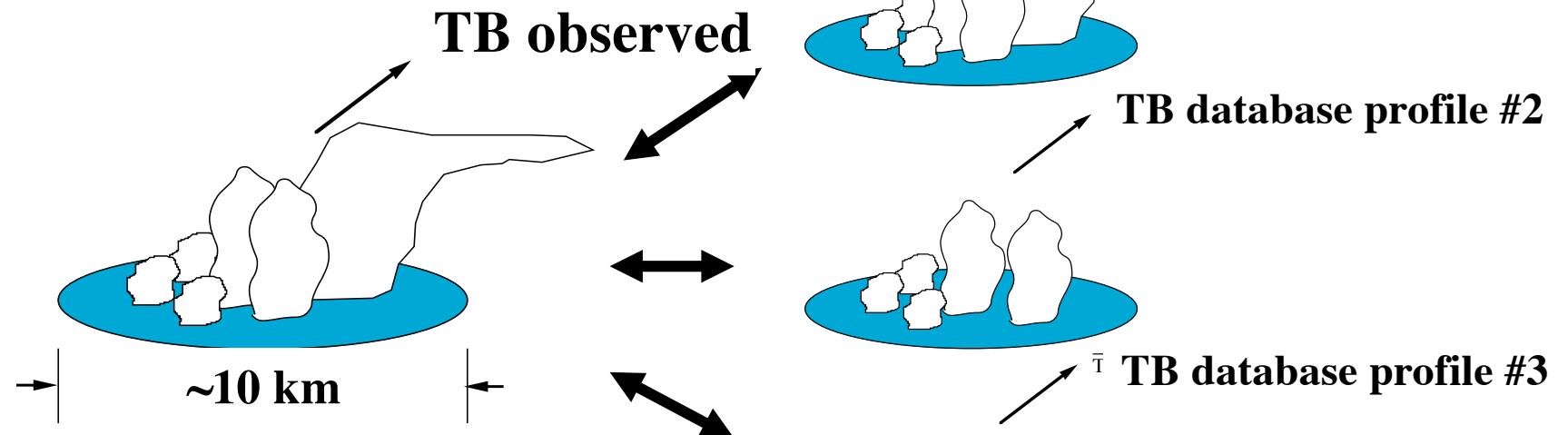


Christian Kummerow
Dave Randel
Sarah Ringerud
David Duncan & Joe Munchak
Veljko Petkovic
Norm Wood & Mark Kulie
Guosheng Liu
Walt Petersen
Pierre Kirstetter

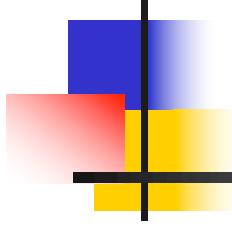
The GPM radiometer algorithm

Step 1: Use GPM Satellite to derive set of “Observed” profiles that define an a-priori database of possible rain structures.

Step 2: Compare observed Tb to Database Tb. Select and average matching pairs



$$J_i = \exp \left\{ -\frac{1}{2} [\mathbf{tb}^o - \mathbf{tb}(R_i)]^T (\mathbf{O} + \mathbf{S})^{-1} [\mathbf{tb}^o - \mathbf{tb}(R_i)] \right\}$$

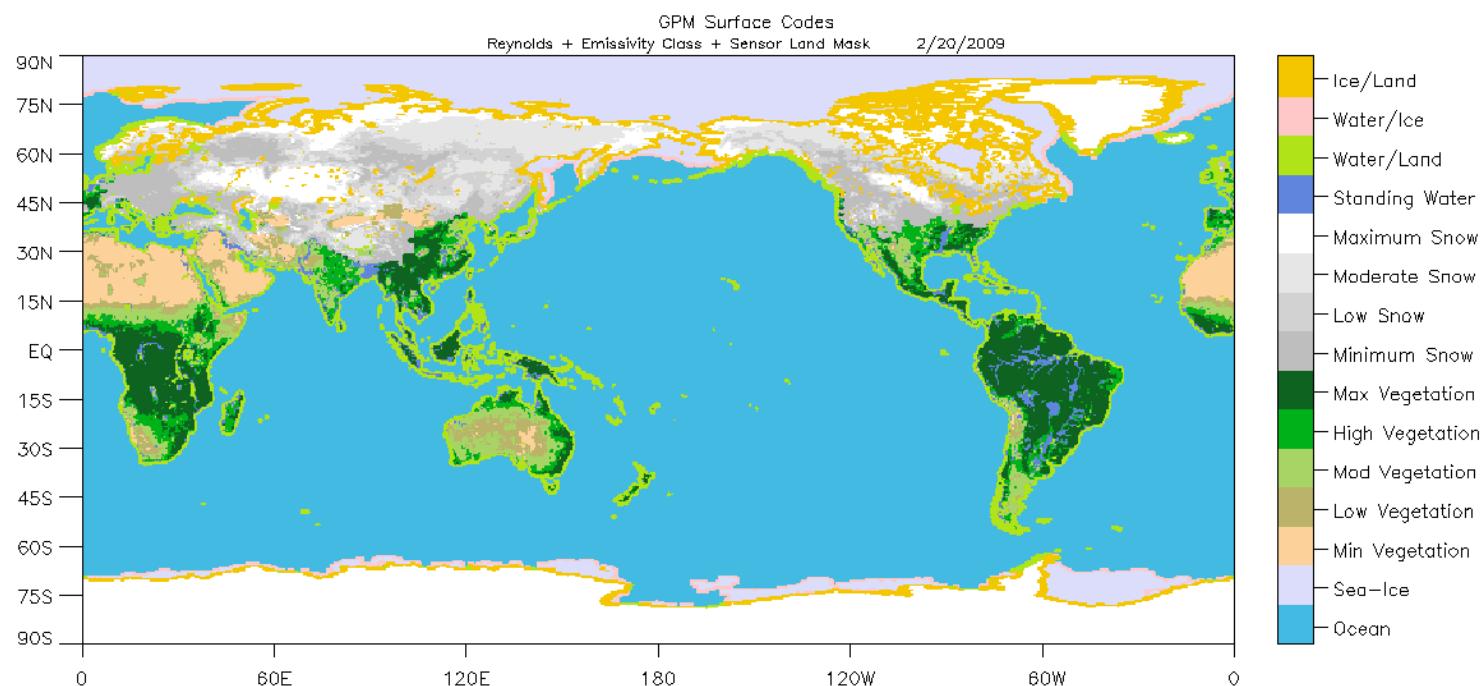


GPROF 2014 Database Divisions

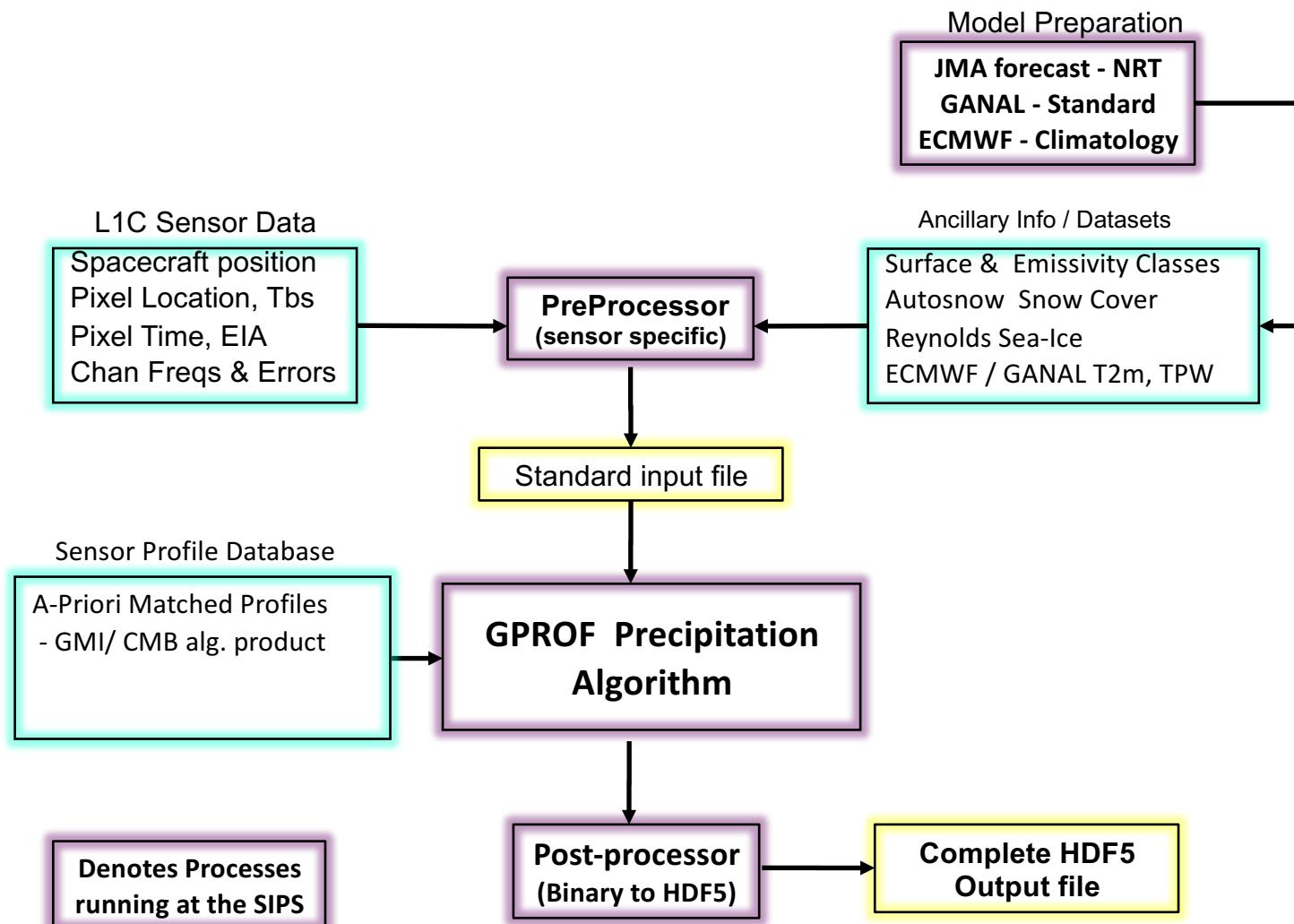
For Operational Algorithm:

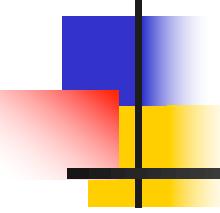
Do not to mix different surface types

Do not to mix different T_{2m} or TPW

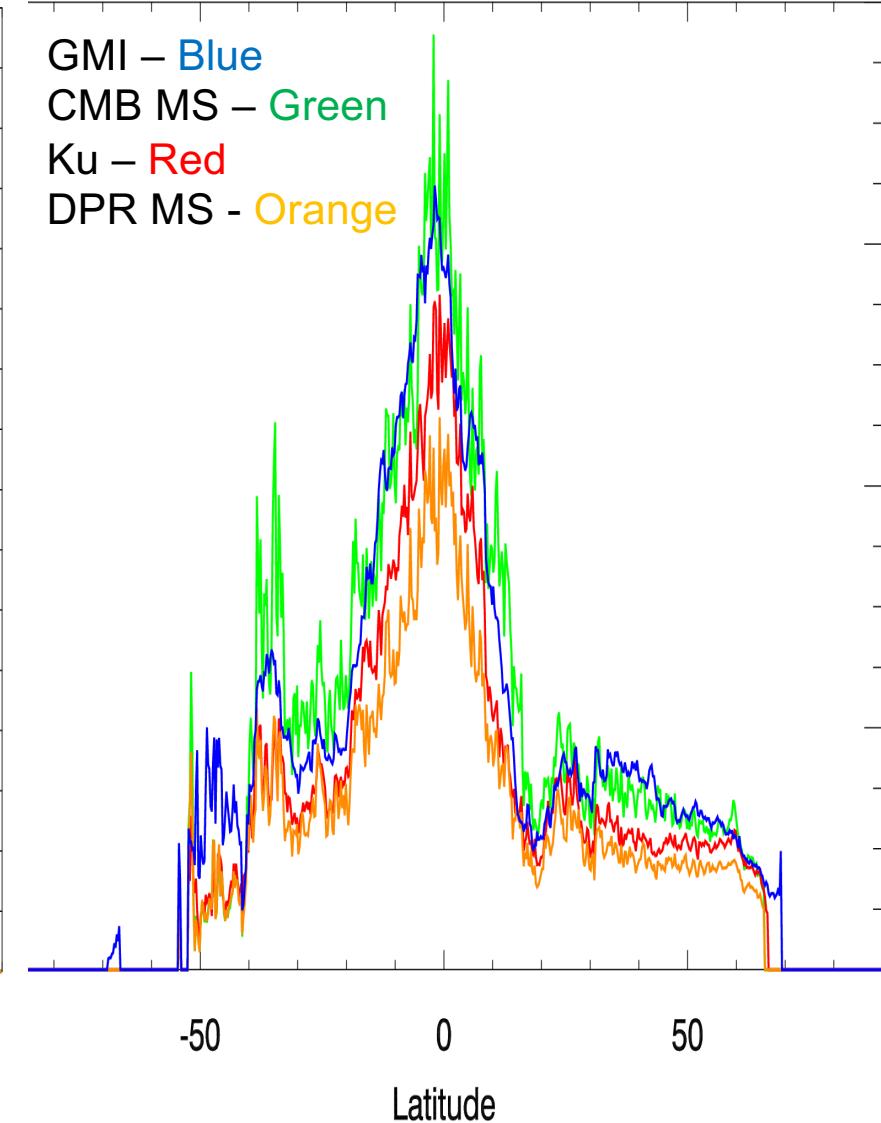
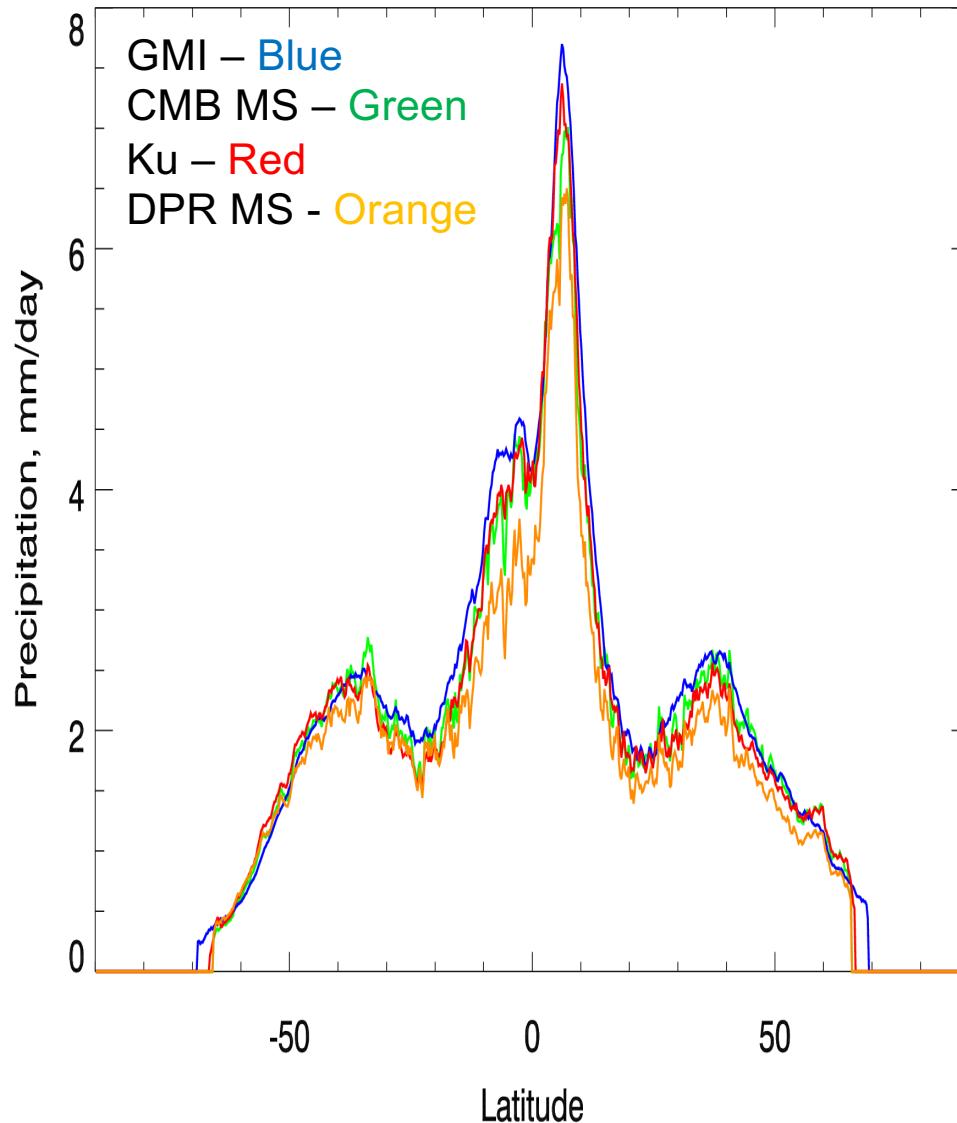


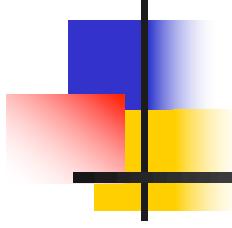
GPROF 2014 Unified Algorithm Structure



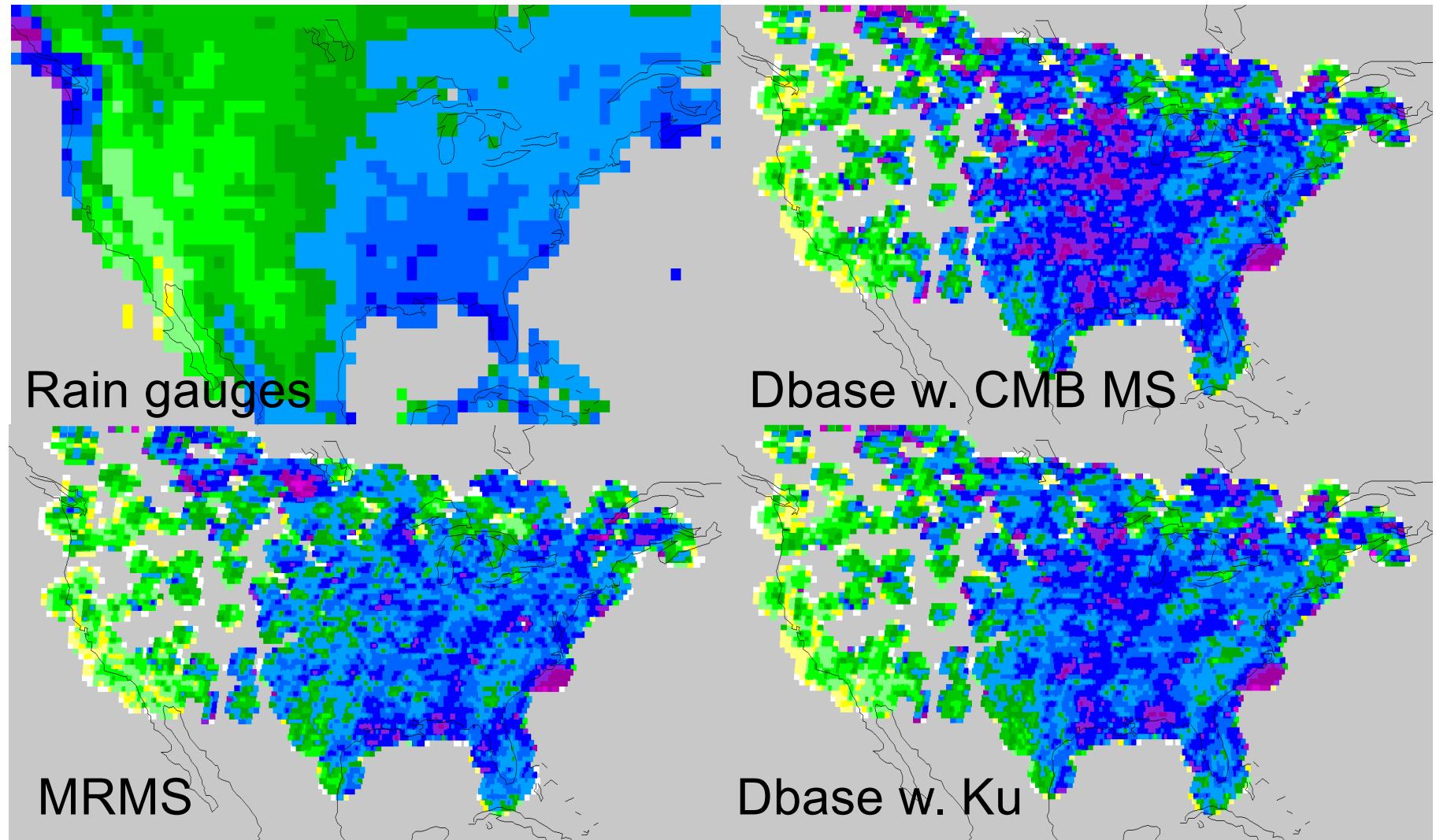


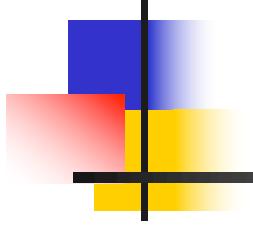
Early Implementation





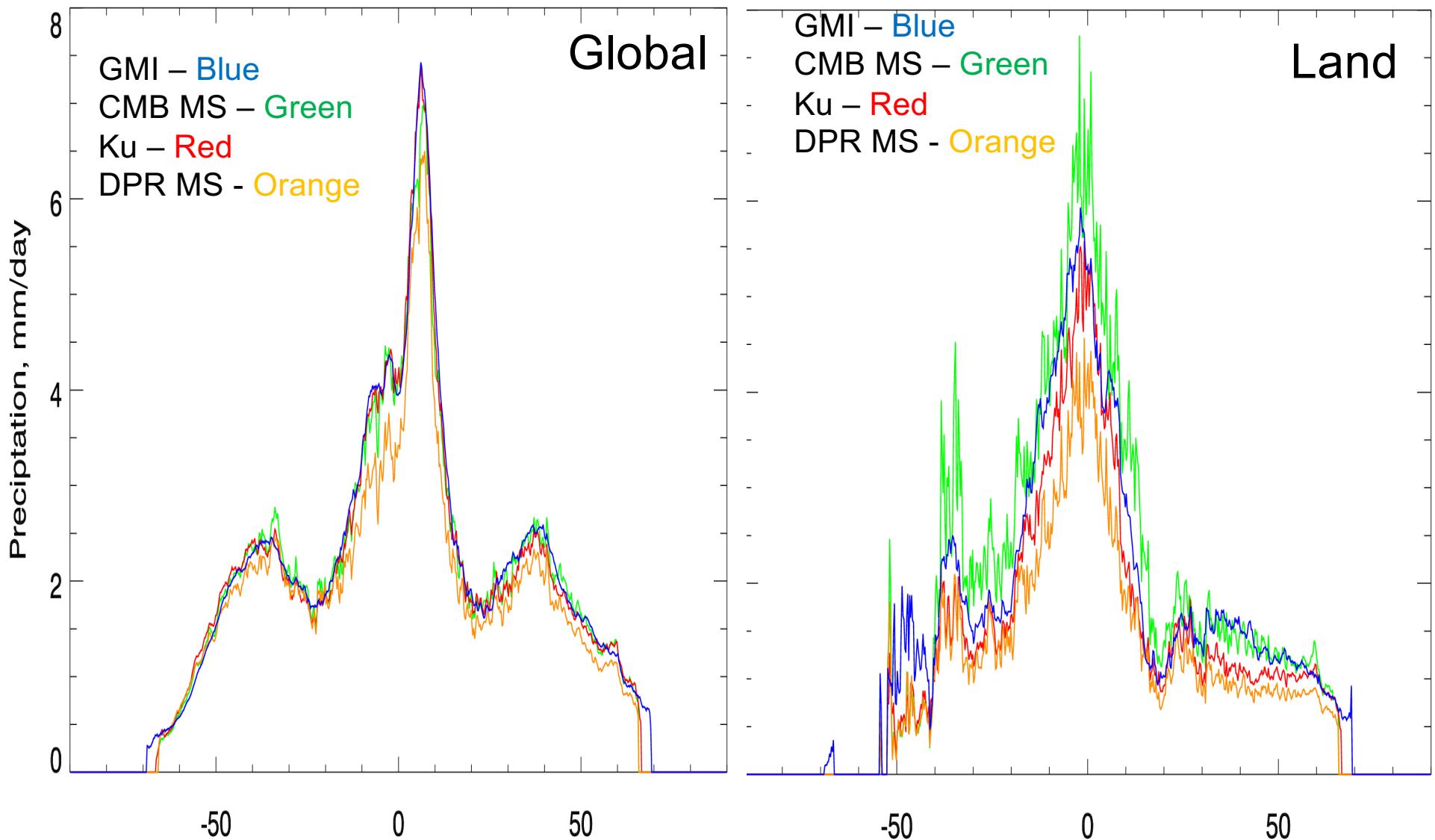
Assessment of potential databases



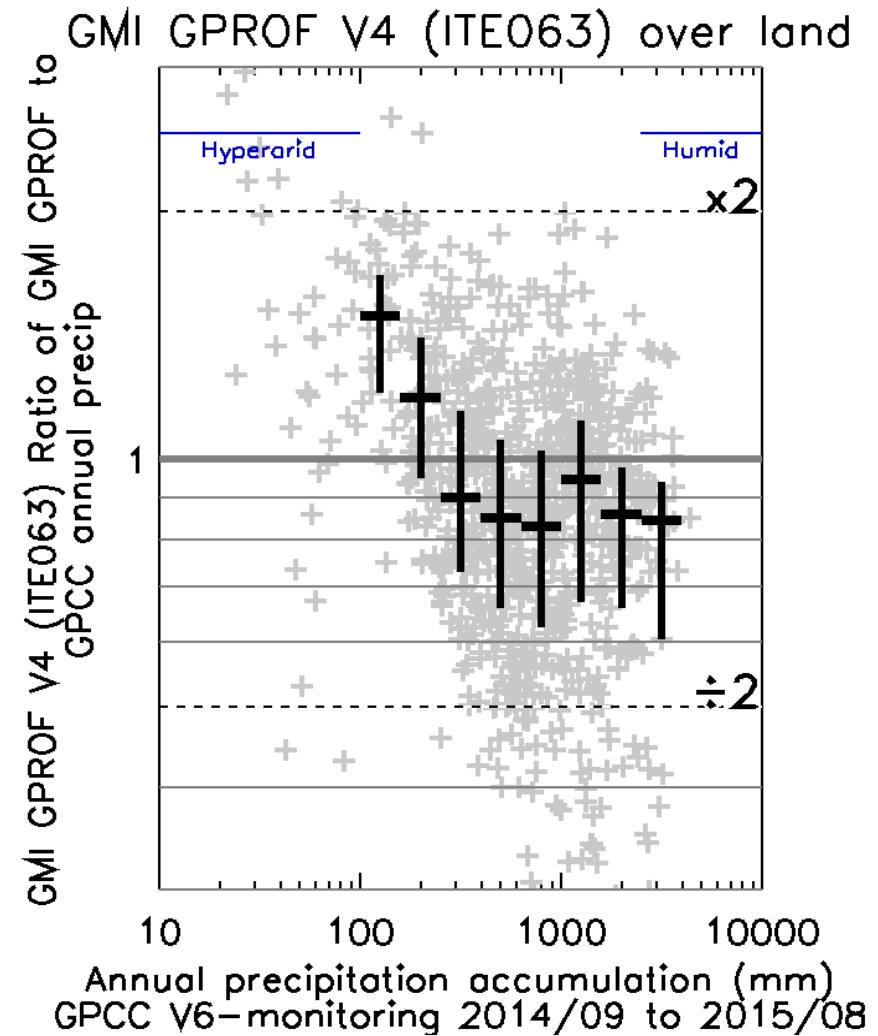
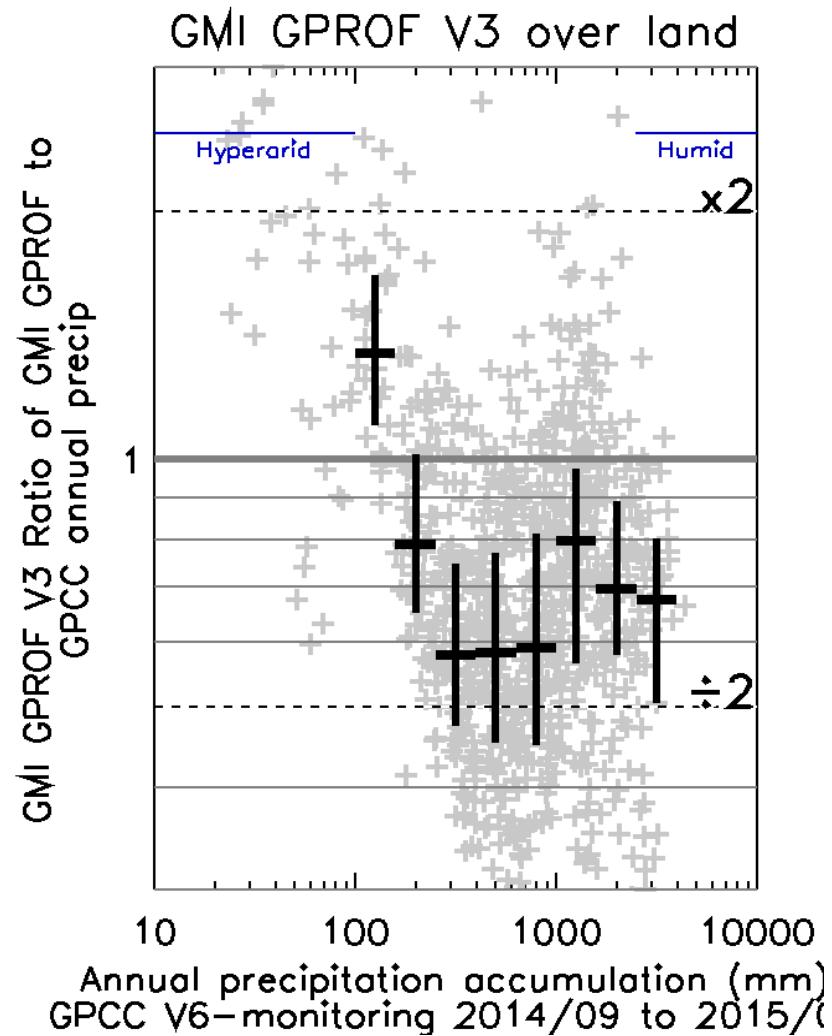


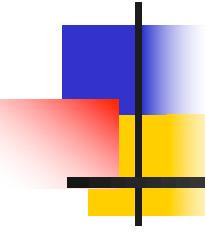
GPROF V4 as delivered

CMB over ocean; DPR Ku over land

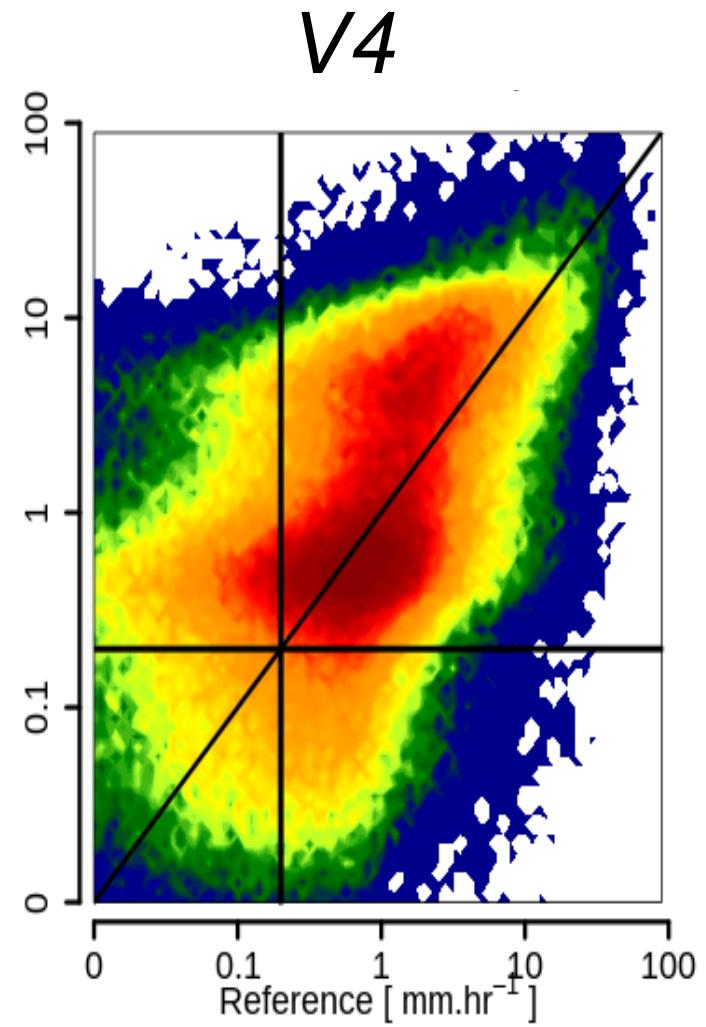
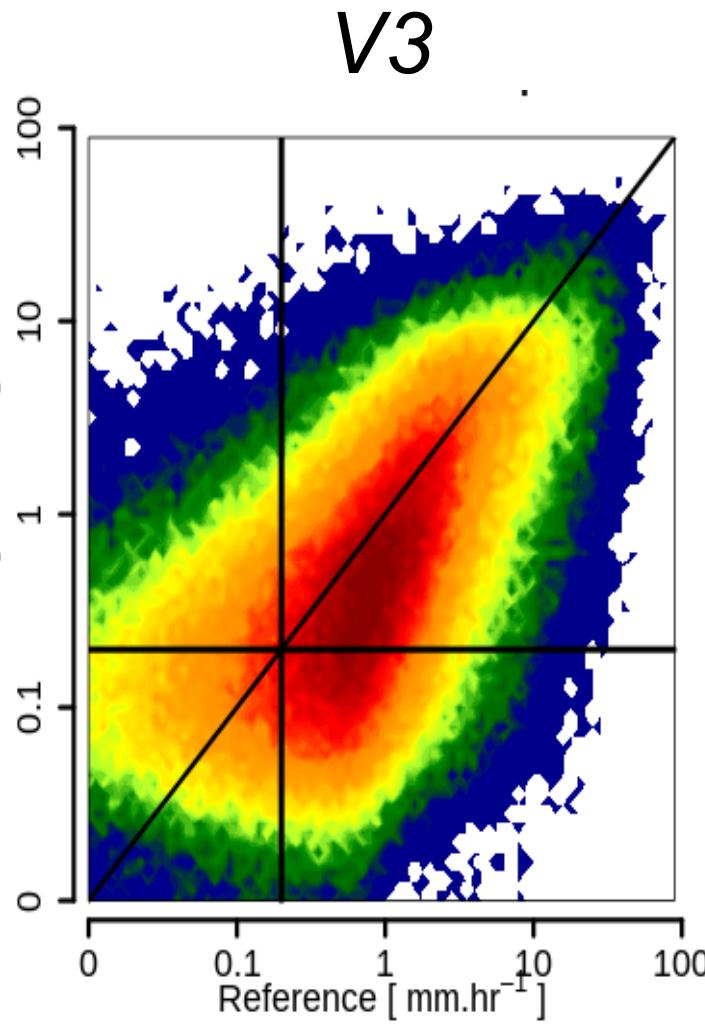


GPROF V3 and V4 as delivered



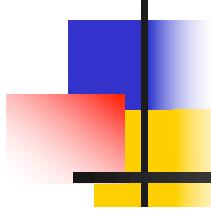


GPROF V3 and V4 as delivered



5 11 19 30 45 66 103 175 471

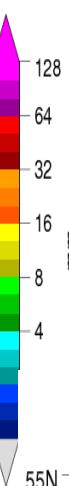
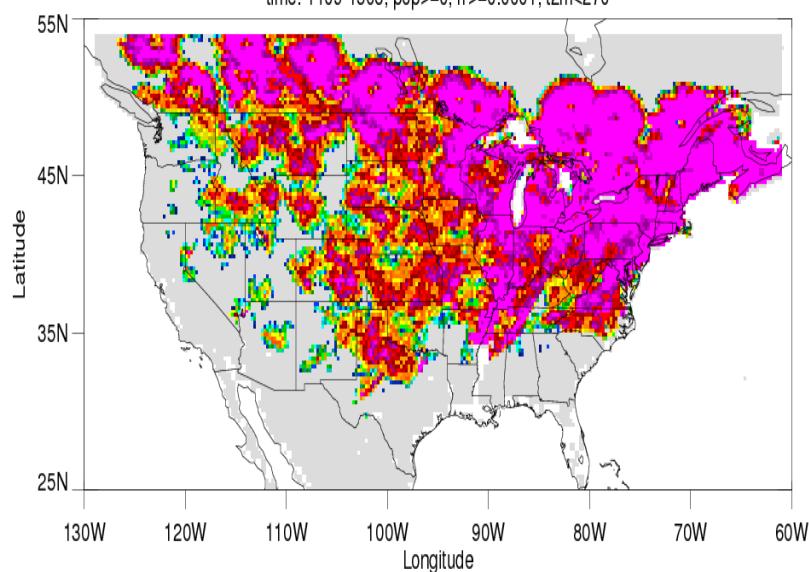
5 11 19 30 45 66 103 175 471



MRMS vs GPROF V4 ($T_{2m} < 270K$)

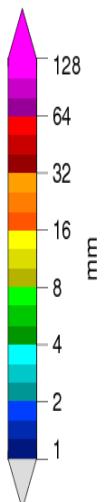
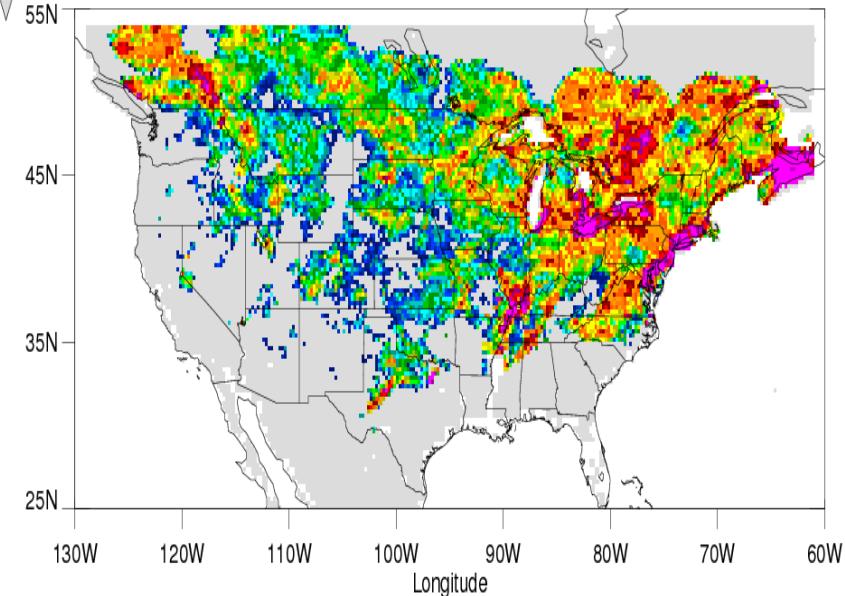
MRMS annual precip accumulation V3B - GV; Land+Snow sfc

time: 1409-1508; pop>=0; rr>=0.0001; t2m<270

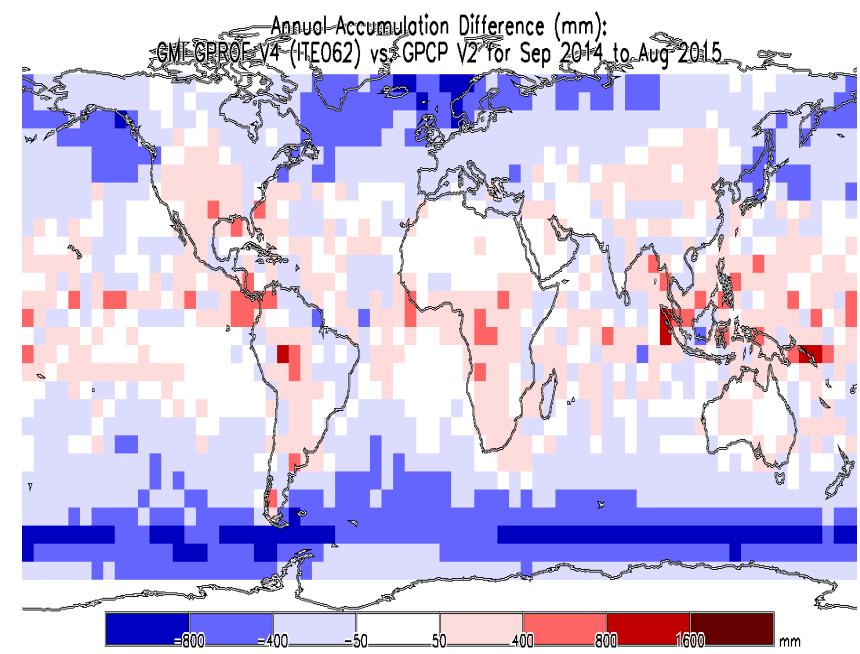
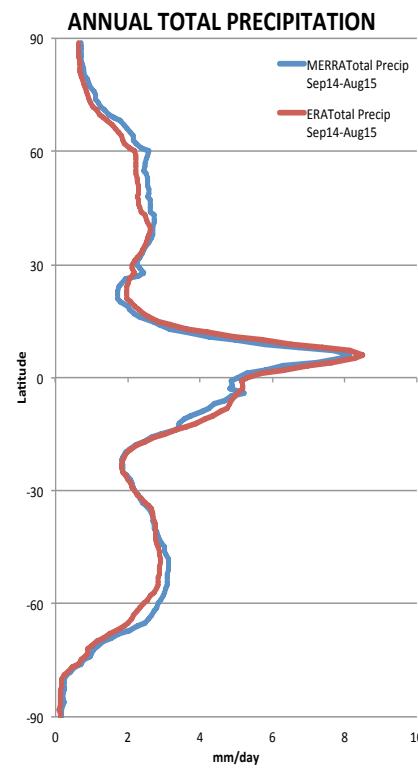
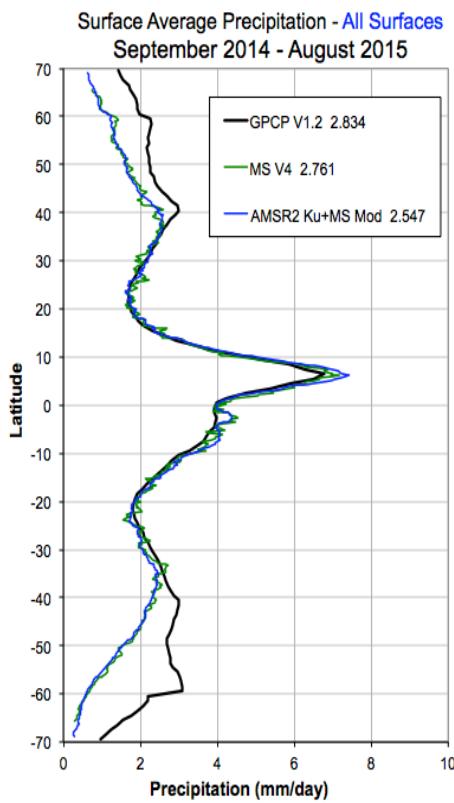
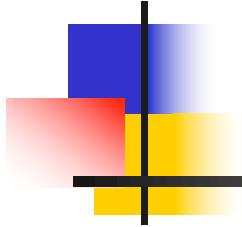


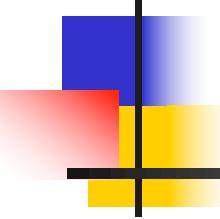
GPROF annual precip accumulation V3B - GV; Land+Snow sfc

time: 1409-1508; pop>=0; rr>=0.0001; t2m<270



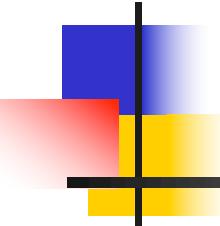
Too little precipitation at high latitude?



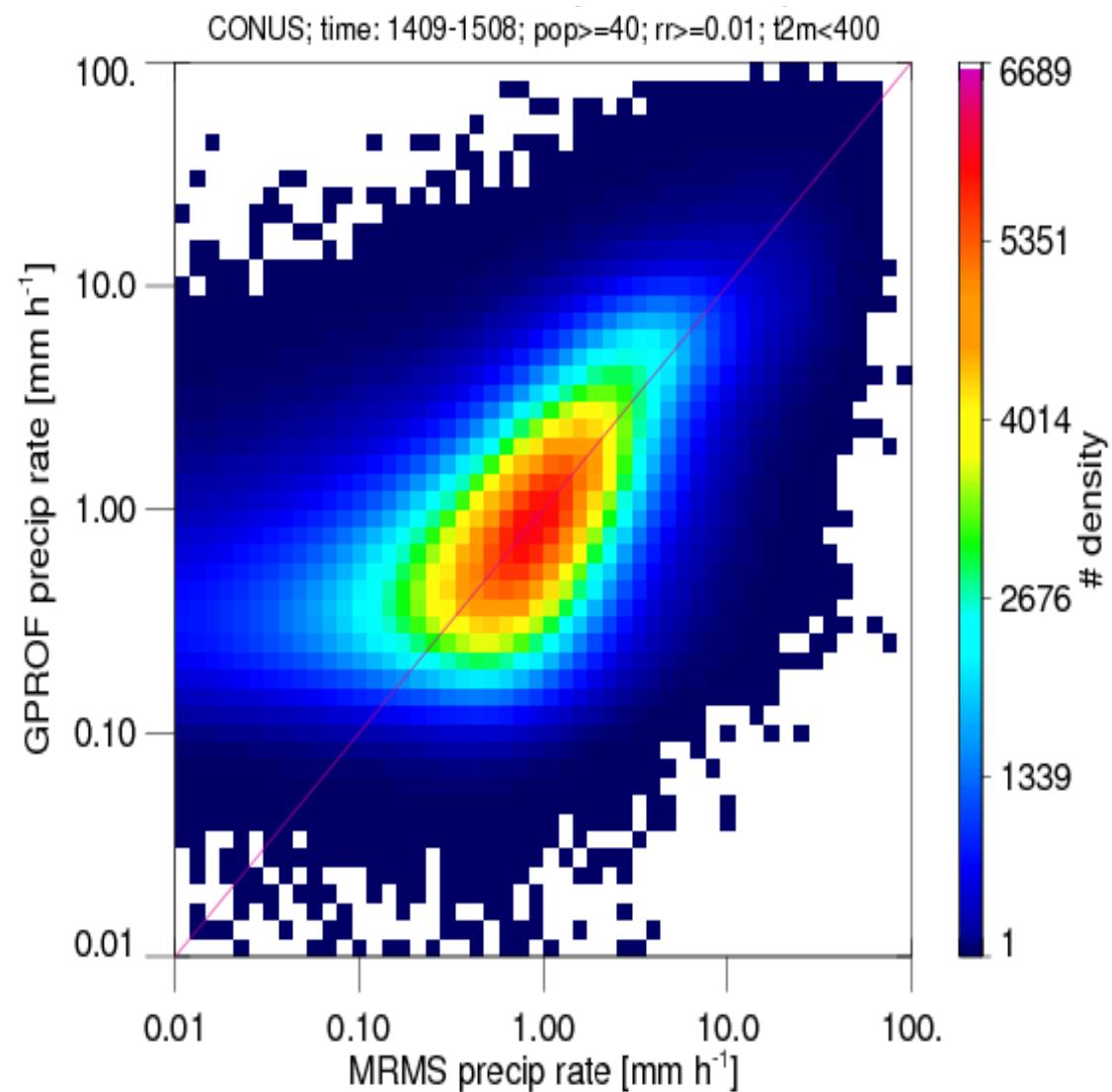


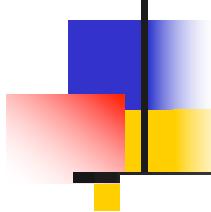
Version 5

- Address odd correlation plot (bird's nest).
Turned out to be small software error – ✓
- Address missing snow over land
Use MRMS over snow to construct database – ✓
- Address missing high latitude rain
Use CloudSat/GMI to construct database –
- Add rain/no-rain discrimination. Probability of precipitation causes a lot of problems for users.
Match precipitation probability to precipitation occurrence in a-priori for each sfc, Temperature and TPW bin. – ✓

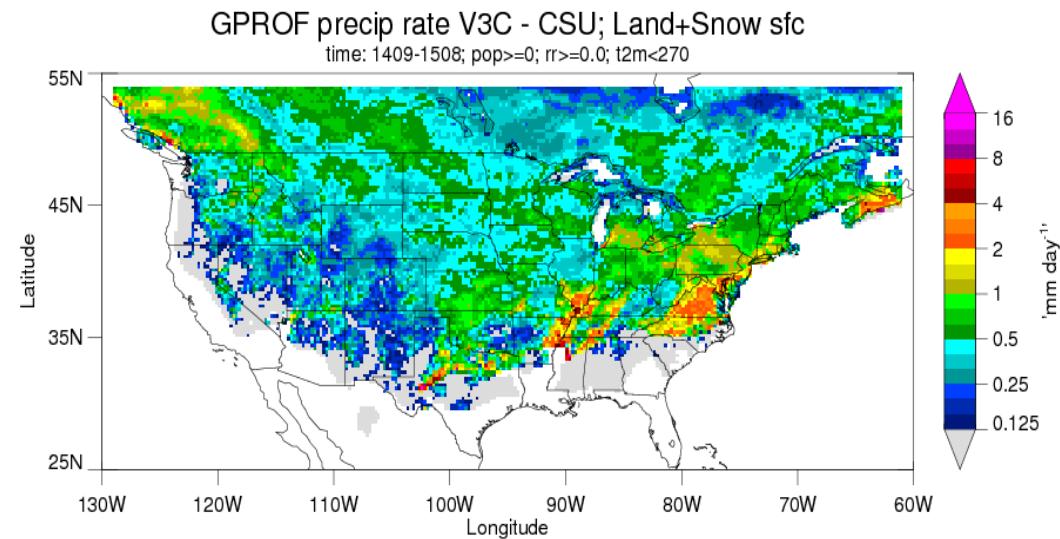
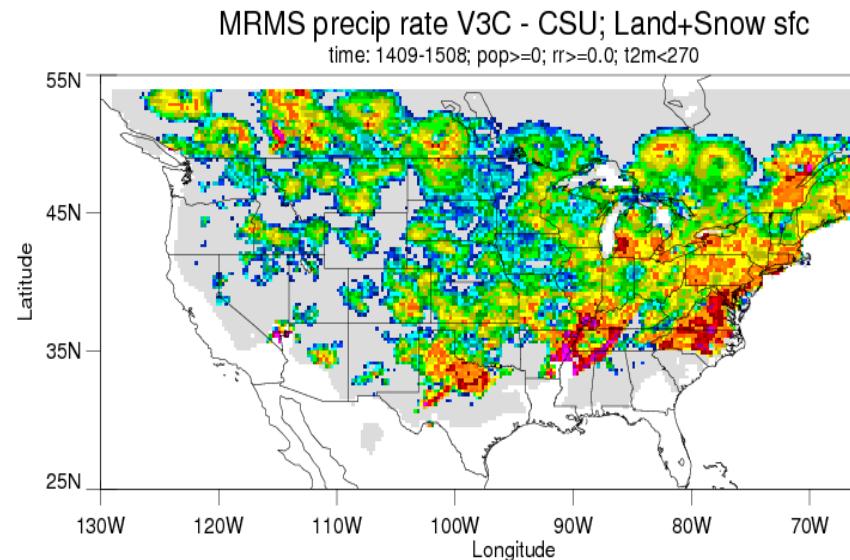


GPROF V5. Feature is no longer there

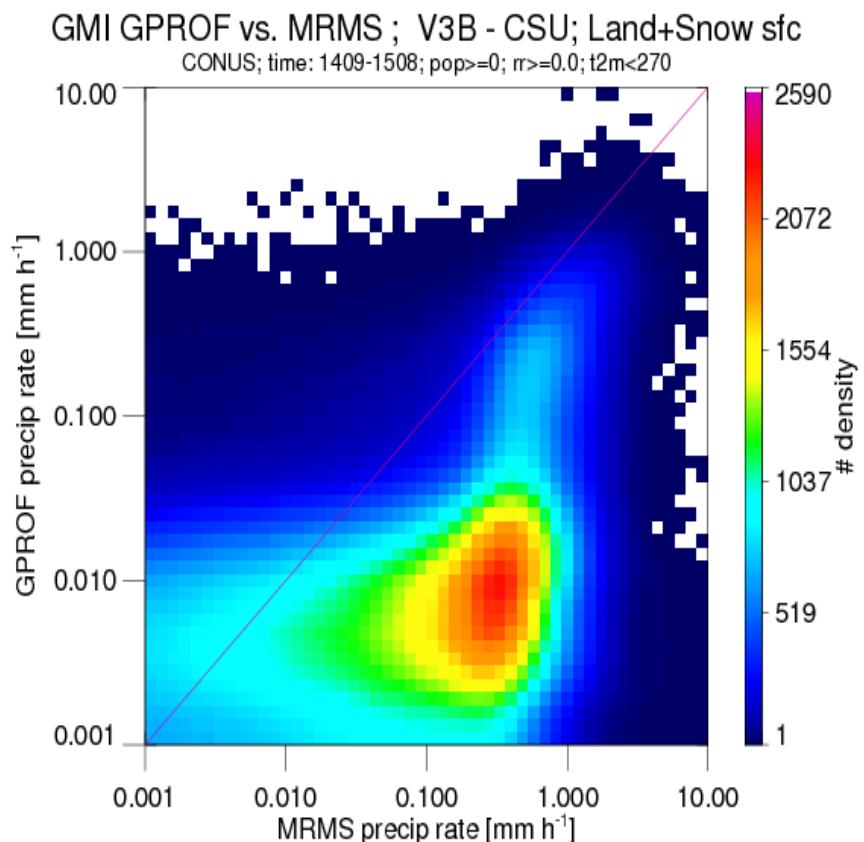
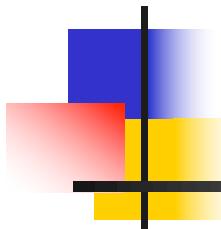




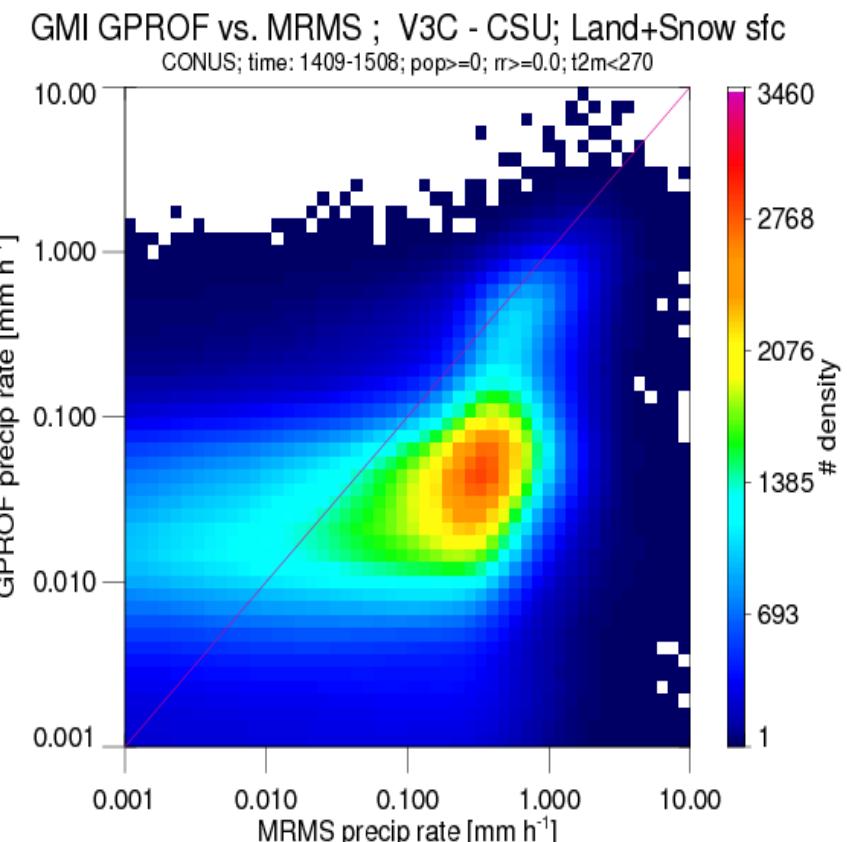
GPROF V5 using MRMS for Sfc = snow



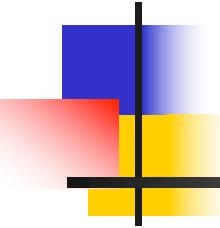
GPROF V5 w.MRMS dbase over snow



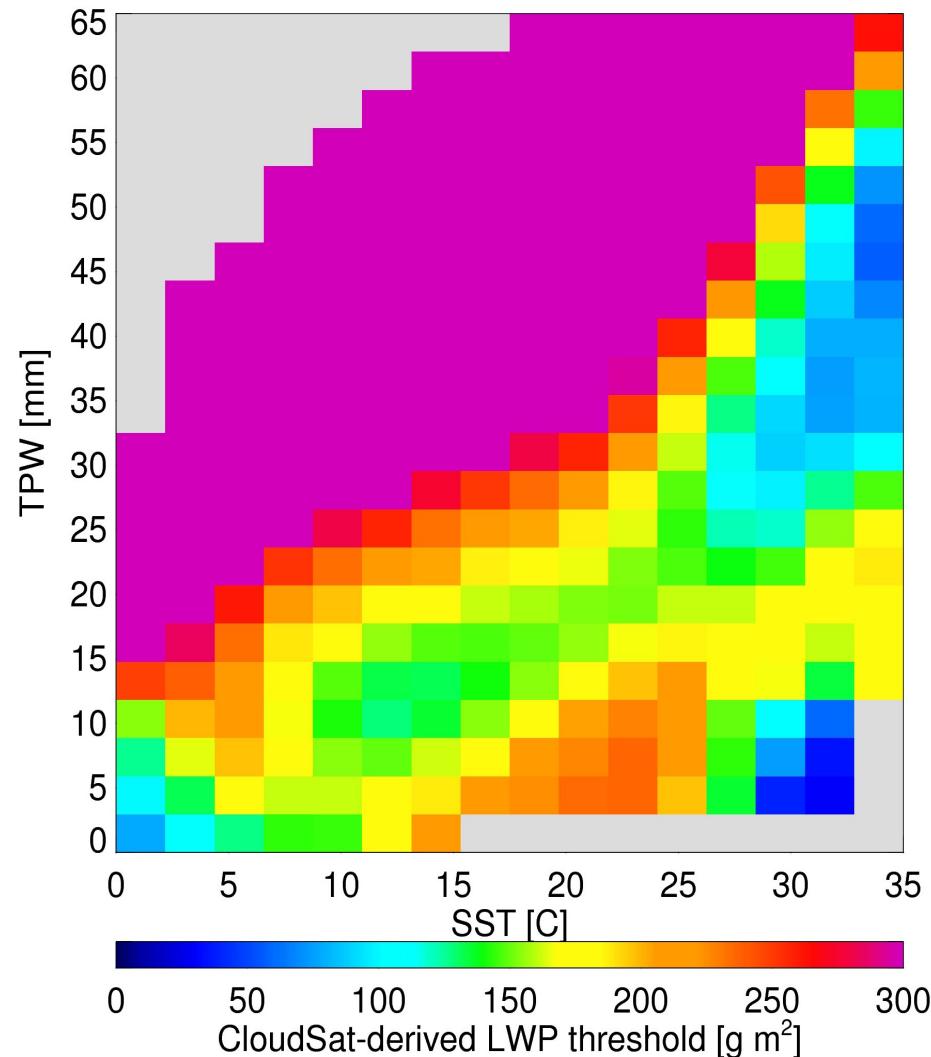
GPROF bias : -73 % Correlation: 0.31



GPROF bias : -25 % Correlation: 0.37



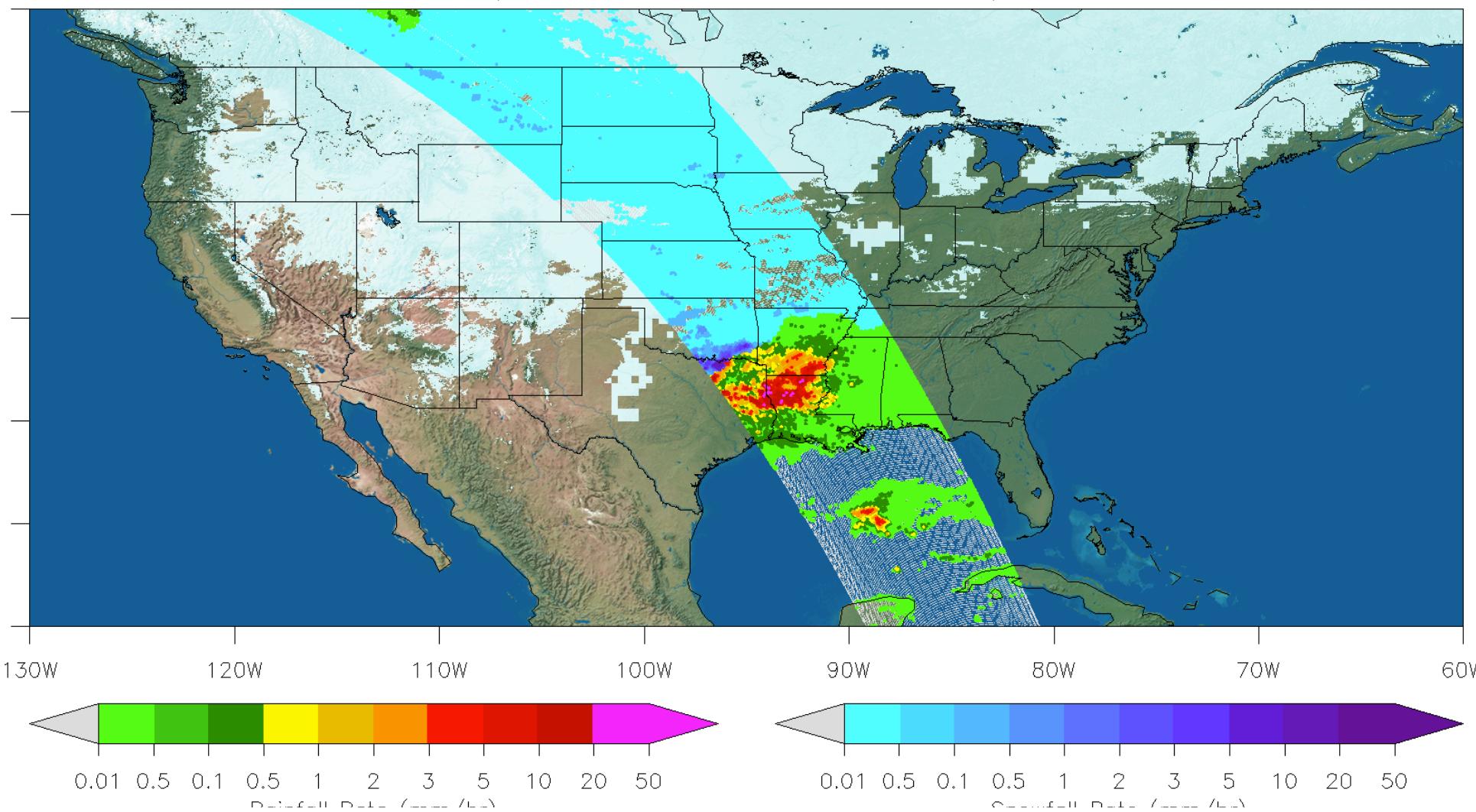
CloudSat based LWP Thresholds

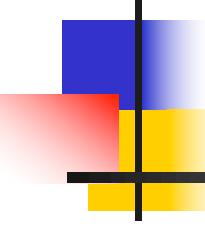


GPROF GMI V4 - No Probabilities Applied

1 January 2015, 16:22Z Precipitation

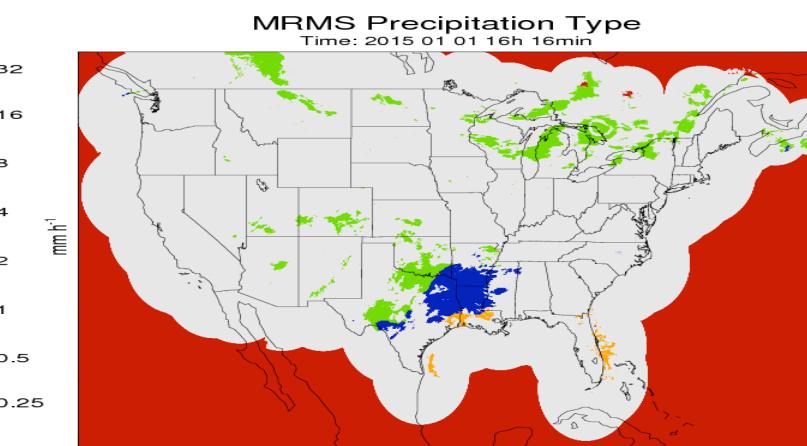
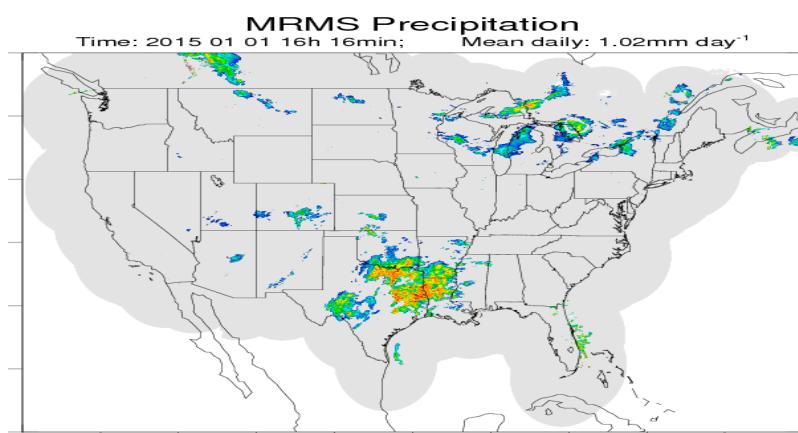
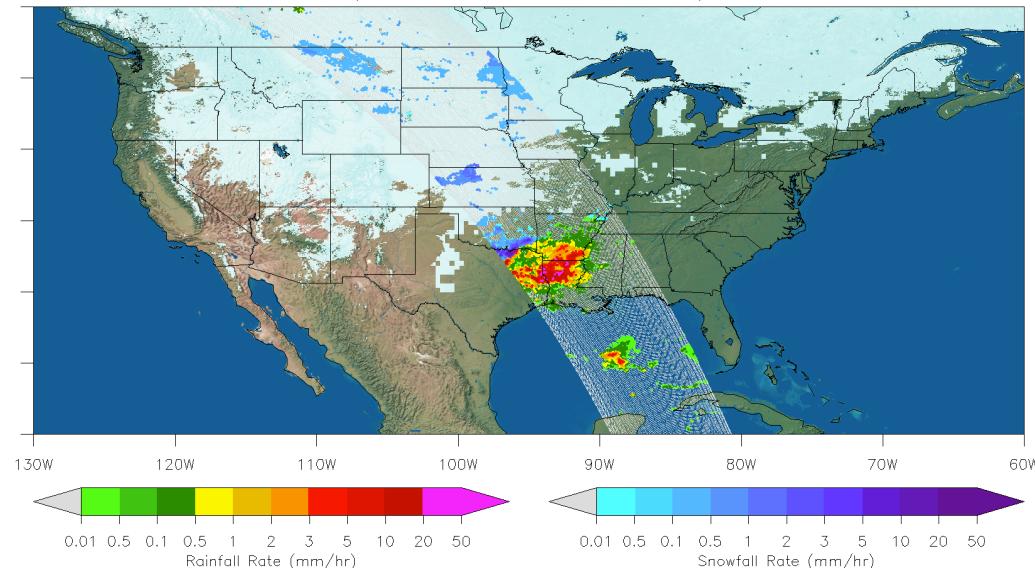
(GPM GMI, GPROF 2017_V1_1610, Rev 04792)





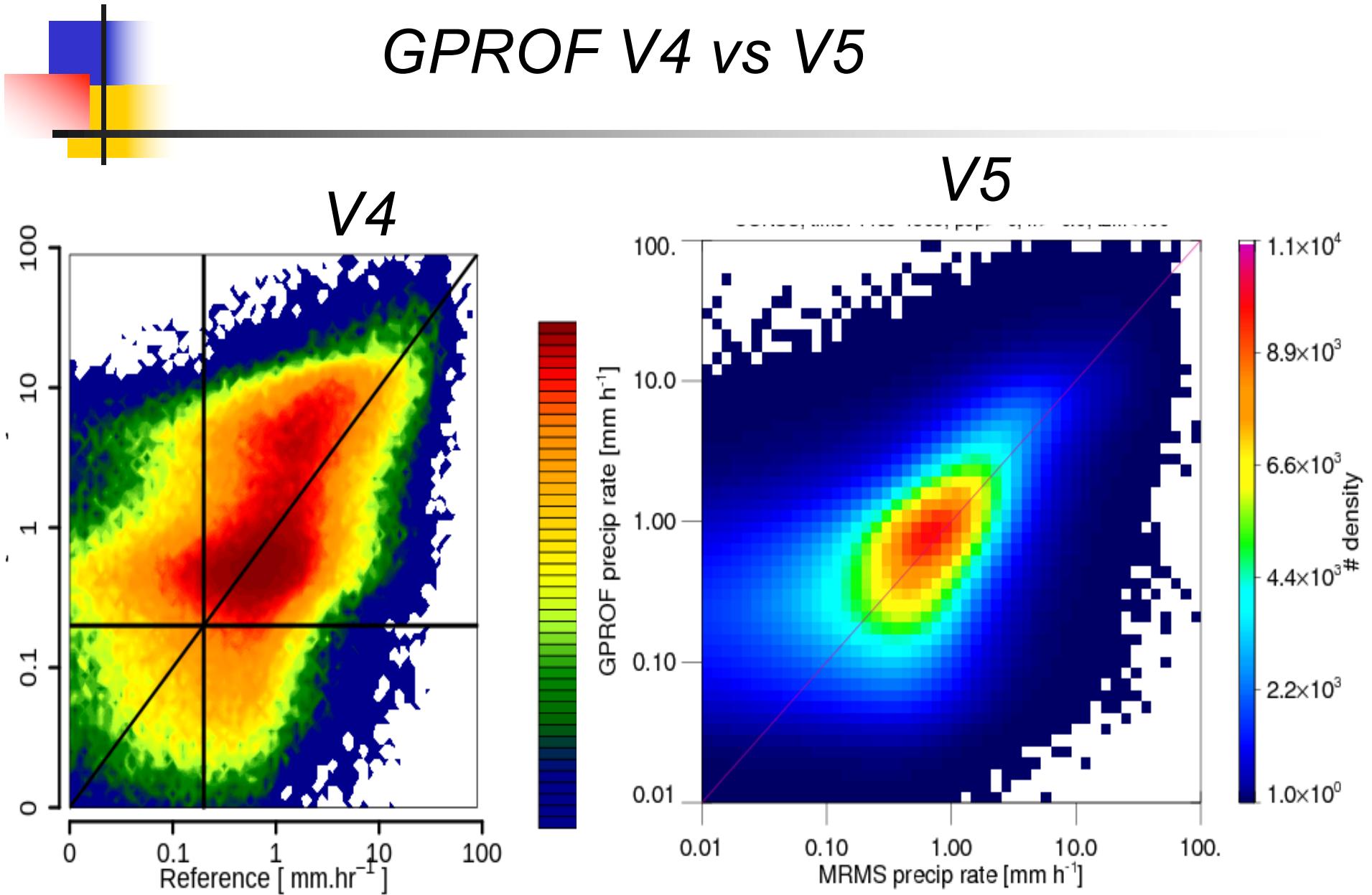
GPROF 2017 V1 – GMI V5 vs. MRMS

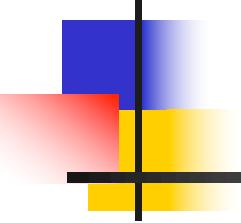
1 January 2015, 16:22Z Precipitation
(GPM GMI, GPROF 2017_V1_1610, Rev 04792)



- Tropical/Convec
- Tropical/Stratifor
- Cool Stratiform
- Hail
- Convective
- Snow
- Warm Stratiform
- Warm Stratiform
- No rain
- Missing

GPROF V4 vs V5





GPROF V5 schedule

Nov. 18 - Finish high latitude precipitation for GMI and deliver to PPS

Dec. 9 – Finish MHS code and deliver to GSFC for final channel error assessment/adjustment.

Dec. 23 - Finish ATMS code and deliver to GSFC for final channel error assessment/adjustment

Jan. 13 – Finish AMSR2 and deliver to PPS

Jan. 27 – Finish SSMIS and deliver to PPS

Feb. 10 – Finish TMI and deliver to PPS